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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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EXAMINER

LOUIE, WAI SING

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 03/15/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/533,619

Applicant(s)

HUI ET AL.

Examiner

Wai-Sing Louie

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) 8-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1-7 are rejected under 35 U.S.C. 102(e) as being anticipated by Shields (US 6,316,345).

With regard to claim 1, Shields discloses a method of forming metal contacts in a semiconductor device (col. 2, line 26 to col. 4, line 13 and fig. 2) comprising:

- a) Providing an interlayer dielectric 20 on the lower layer (fig. 2a);
- b) Providing an antireflective coating (ARC) layer 30, at least a portion of the ARC layer 30 being on the interlayer dielectric (fig. 2a);
- c) Providing a plurality of via holes 50 in the interlayer dielectric 20 and the ARC layer 30 (fig. 2a);

- d) Filling the plurality of via holes 50 with a conductive material 60;
- e) Removing the ARC layer 30 while reducing subsequent undesirable conductive material 60 and subsequent the uneven metal contact 70 is polished with a chemical mechanical polish (CMP) while removing the ARC layer (col. 2, line 52 to col. 3, line 13).

With regard to claim 2, Shields discloses removing the ARC layer using plasma etching (col. 2, line 56 to col. 3, line 5).

With regard to claim 4, Shields discloses the conductive material used to fill the plurality of via holes 50 is W (col. 2, line 49).

With regard to claim 7, Shields discloses providing a CMP of the conductive material (col. 2, line 55 and col. 3, line 7).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shields (US 6,316,345) in view of Brooks et al. (US 5,786,276).

With regard to claim 3, Shields discloses utilizing a CF_4 type fluorine containing chemistry etching (col. 2, lines 58-64), but does not disclose the $\text{CH}_3\text{F}/\text{O}_2$ or CHF_3/O_2 . However, Brooks et al. disclose using a mixture of methyl fluoride (CH_3F), carbon tetrafluoride (CF_4) and oxygen (O_2) to remove the silicon nitride, which is the antireflective coating material (Brooks col. 2, lines 57-64 and table 1A). Brooks et al. teach that it is difficult to etch silicon nitride (Brooks col. 2, lines 31-36) and Brooks et al. introduce the chemical downstream etching which is faster and selectively for nitride (Brooks col. 3, lines 20-23). Therefore, it would have been obvious to one with ordinary skill in the art to use CH_3F , CF_4 , and O_2 mixture to dry plasma etch the ARC in order to yield faster rate.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shields (US 6,316,345) in view of Wu et al. (US 6,222,214).

With regard to claim 5, Shields does not disclose the interlayer dielectric 20 is BPTEOS. However, Wu et al. disclose a method of forming metal contacts in a semiconductor device utilizing BPTEOS as interlayer dielectric layer (Wu col. 6, lines 32-44). Wu et al. teach that BPTEOS is a low flow glass and a good barrier layer (Wu col. 6, lines 32-44). Therefore, it would have been obvious to one with ordinary skill in the art to use BPTEOS as dielectric interlayer in order to apply it easily and it is good barrier layer.

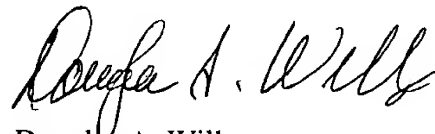
Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shields (US 6,316,345) in view of Venkatesan et al. (US 6,326,301).

With regard to claim 6, Shields does not disclose the lower layer includes a plurality of memory cells. However, Venkatesan et al. disclose the substrate could support a plurality of integrated active devices including memory cells (Venkatesan col. 5, lines 28-37). Therefore, it is obvious the lower layer could be a plurality of memory cells.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (703) 305-0474. The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



Douglas A. Wille
Patent Examiner



wsl

March 6, 2002